IRON BRIDGE AT LOCK #68

HISTORIC STRUCTURE REPORT

CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK

ARCHITECTURAL DATA

By

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PHOTOGRAPHS

Photographs by Thomas E. Fields

Photographs by Jet T. Lowe, April 1989
Historic American Engineering Record

I. ADMINISTRATIVE DATA

A. Name of Structure

Old Steel and Wood Bridge over Lock 68, Allegany County, Chesapeake and Ohio Canal National Historical Park, Maryland.

B. Proposed Use of Structure

The List of Classified Structures for this park has not been completed. Therefore, the Order of Significance of this bridge has not been established nor has the level of treatment been determined. The General Plan for the park proposes that the 8.5 mile section of the canal between Paw Paw Tunnel and Oldtown, which contains the bridge over Lock 68, be managed as Zone, E - Long Term Remote. No public access other than by towpath is proposed to this site. Present park plans would propose future stabilization and preservation of the bridge and abutments to preserve the historical scene.

C. Justification for Such Use

This bridge carried a road which once led from Maryland Highway #51, one half mile to a river ford and ferry to the settlement of South Branch Depot, later French Station, on the B & O Railroad. The bridge was used as private access to agricultural fields on the riverside of the canal until 1975, when engineering studies determined that this use was no longer safe. The private access is now by a dike constructed by the National Park Service across the canal approximately 500 feet east of the bridge site.

D. Cooperative Agreements, if Any, Executed or Proposed for the Structure

There are no cooperative agreements executed or proposed for this structure.

E. Description of Proposed Construction Activity

Pending a final determination of any development for Section 27 according to the General Plan, appropriate preservation treatment should be given to the steel and wood bridge over Lock 68, as needed to prevent further deterioration of the structure.

II. SUMMARY OF HISTORICAL DATA

The bridge over Lock No. 68 was originally a wood pivot bridge. It is approximately 164.83 miles from tidelock. It permitted the landowner to cross the canal to the low-lands between the canal and the Potomac River.

On May 1, 1841, Assistant Engineer Thomas L. Patterson reported that on his division, the value of the bridge authorized but not commenced as of January 1, 1841, was:

Pivot Bridge at Lock No. 68		$1,000.00

On July 14, 1850, Superintendent H. M. Dungan notified Chief Engineer Charles B. Fisk that to complete a certain pivot bridge on his division would require:

3240	Superficial feet of white oak for flooring	$48.60
375	Locust pins	5.00
84	Lineal feet of 12-inch timbers for coping	16.80
54	Pounds of iron bolts for coping	6.75
483	Pounds of iron bolts for chords	63.12
	Workmanship and contingencies	100.00
		$240.27

The bridge had been completed by the time the "fifty-mile section" was opened to navigation in October 1850. During the Civil War, the pivot bridge across Lock No. 68 was destroyed by Rebel raiders.

Imboden, one of the Confederate officers, had sent several detachments across the river to wreck havoc on the canal. Besides burning the pivot bridge across Lock No. 68, the Rebels captured fourteen boats. After unhitching and appropriating the horses and mules, they set fire to the crafts, most of which were loaded with coal. Hearing the bugles sound "recall", they then recrossed the Potomac and reported to Imboden.

Superintendent Lloyd Lowe, on July 25, announced that damage done by the Rebels on his division would not interrupt navigation more than two additional days. The bridge on the county road spanning Lock No. 68 had been burnt, and the fire as it spread had damaged the lock gates. Eight boats had been burned in the level below the lock.

Apparently Lock No. 68 bridge was not replaced until after the conclusion of the war. On June 26, 1865, Lowe notified Ringgold that local citizens were demanding that the bridge, burnt by the Rebels at Lock No. 68, be rebuilt. Because of the "high price of lumber, etc.", Lowe had been dragging his feet. Now that the war was over, action was necessary. Lowe had accordingly prepared a plan for a simple but substantial bridge on which he had received proposals, ranging from $1,000.00 to $1,200.00. The span would be 72 feet.

The Board of Directors on July 13, 1865, after studying Lowe's report, directed the superintendent of the Cumberland Division to have the bridge at Lock No. 68 rebuilt in a suitable fashion.

Lowe, accordingly on July 27, closed the contracts to have the bridge rebuilt. The contractor promised to have the bridge open to traffic in September.
It was in operation continuously until it started to deteriorate. Then the present iron bridge was built around 1910 by landowners to replace the pivot bridge.

Note: The foregoing is a summary of historical data pertinent to the bridge over Lock No. 68 contained in *Historical Structures Report, The Bridges, Chesapeake and Ohio Canal National Historical Park.* (Denver: National Park Service, 1968), by Edwin C. Bearss. Refer to that document for citations of source material.

III. EXISTING CONDITONS

The present iron bridge over Lock No. 68 is eighty four feet seven inches long, and about twelve feet wide. This structure is placed on concrete sills on top of stone abutments at both ends.

The abutment on the towpath side is almost square in plan. Running perpendicularly to the canal, it is twenty-three feet ten inches long at the base and tapers to twenty-two feet eight inches at the top. The width, parallel to the canal, is twenty feet six inches. The average height of this supporting structure, excluding the concrete sill, varies from seven feet ten inches to eight feet nine inches. Three stonewalls of this support are exposed and the fourth is covered by fill, which is topped by a dirt road. This road connects the lowlands beside the Potomac River to the bridge. This abutment was built on a fairly level surface, just to the riverside of the towpath.

The north abutment was constructed just to the outside of the bypass flume of the lock. This unit juts out of the slope of live rock providing continuity for the county road. The face of this abutment, (facing the canal), is approximately eighteen feet high, not including the concrete sill, and about twenty-two feet wide. The depth of the abutment, from the edge of the face back to the point where the stonewall ends, is sixteen feet six inches on the up-river side and only ten feet on the downriver side.

Both stone abutments are found to be inconsistent with the majority of the masonry work in the canal. The prevalent pattern found on this structure is coursed fieldstone and rough rubble. The corner stones show that they need some stabilization. Deterioration of stone voids in the walls, and joints lacking mortar are evident. The possibility of finding voids inside the abutments is strong. Considerable settlement is obvious due to uneven lines of stonewalls, joints, and horizontal and vertical cracks. Vegetation is growing rampant on these walls.

Concrete sills on top of both abutments are found to be transferring live and dead loads from the bridge to the abutments. Although there are significant differences of heights of the abutments, the top elevations of the two sills are within one foot of each other. There are signs that indicate that they were poured on two different occasions; the first being the base that rests squarely on the stones, and the second being the retainer that holds fill back and allows the bridge proper to rest on the concrete base. The bases on both abutments are approximately sixteen feet wide and two feet deep; the height of the retainers is ten inches at the towpath side and one foot six inches at the berm side. Presently, these sills are badly deteriorated.

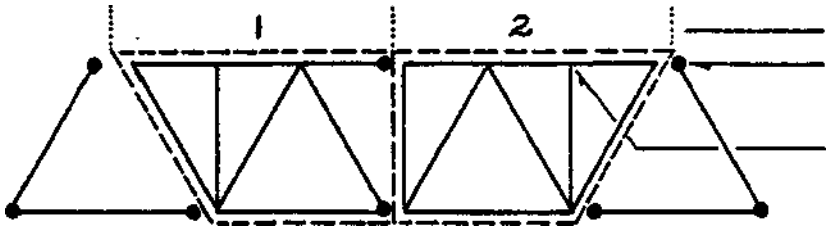
The bridge itself is in fairly good shape. It is composed of two different structural systems due to the fact that it has two spans of considerable difference. The section that spans the towpath and canal is approximately fifty-four feet six inches long. The system used to span this area is a modified Warren truss. The second section spanning the by-pass flume is only thirty feet one inch long and is a simple post and beam construction. A network of iron columns and tie rods is situated between and below these two different structural systems, and between the lock and the by-pass flume at the ground level. Here, the columns are made up of four-inch by three-inch by one-quarter inch iron angles connected together by one-quarter inch iron plates and rivets. They presently rest on concrete footings, which terminate approximately four inches above grade level. These columns are braced by diagonal tie-rods, three-quarter inch in diameter. They are held in place by iron pins.

Starting with the trussed span of the bridge, four ten-inch I-beams running nearly parallel to the lock are spaced at an average of thirteen feet six inches center to center. The I-beams are supported by trusses at both ends and stabilized by three-quarter inch diameter tie-rods crossing each other in each space. They are connected to both ends of each beam. In turn, these beams carry five smaller beams, six inches high, (three I-beams and two C-beams), running perpendicularly. These small beams run from the concrete sill at the towpath side to the ten-inch I-beam supported by the column network. The interior three are spaced at two feet nine inches each while the exterior spaces are two feet eleven inches. Both upper and lower beams are bolted together.

At the north portion of the bridge, (spanning the by-pass flume), three twelve-inch I-beams and two twelve-inch C-beams transverse the length from the column network to the concrete sill on the berm side. The interior spacing correspond closely to that found on the trussed span. Also, the top of these beams are aligned evenly with the upper members of the trussed span, therefore permitting three-inch by six-inch wood runners to run continuously from one end of the bridge to the other. They are fastened to the iron work by a series of staggered bolts. The wood decking is placed perpendicularly on top of these runners and is made up of three-inch by six to eight-inch wide white oak approximately twelve feet long. They are fastened down by common nails.

The trusses make up close to two-thirds of the bridge’s length. They are dominantly made up of one quarter-inch thick angles connected together by one quarter-inch thick plates and connectors. There are seven different shapes of connectors that emphasize directions of forces being exerted by interconnecting members (angles). These shapes are also determined by forces themselves, as well as number of bolts and rivets required to sustain forces applied on them. Of these connectors, the first five are symmetrical on either side of the central vertical member and the other two make up the rest at the central one. At each connector, there are two opposite plates of similar shapes fastened to the angles of interconnecting members. Connectors found at the bottom chord of the trusses are fastened to the ten-inch I-beams by five-inch by four-inch angles. Two, two and one half-inch by two-inch angles joined together by seven and one half-inch by six-inch plates make up the bottom chords of the trusses. Bottom chords of the trusses running below the level of the wood decking are composed of four sections each held together by connectors. In each section, there are four seven and one half-inch by six-inch plates equally apart from each other. The

top chords comprise of three-inch by two and one half-inch angles and continuous plates, one foot wide. They are held together by rivets spaced at an even six inches on both sides, except at areas of connectors. Two three-inch by two half-inch angles held together by three seven and one half-inch by six-inch plates equidistantly spaced make up the diagonal interconnecting members. All diagonal members are approximately seven feet and one half inches long. Finally, the vertical interconnecting members, being the lightest, include two, two and one half-inch by two-inch angles and two seven and one half-inch by six-inch plates. These plates on the vertical members are approximately two feet nine inches apart. These vertical members support hand railings. An overall truss height is a little more than four feet ten inches from the top of the wood decking.
Characteristically, all the interconnecting members described above reflect types of forces being exerted on them. For instance, the bottom chord of the truss reveals tension while the top chord is of the compressive kind. The diagonal members show signs of stress being applied on them while the vertical members appear to be free of any stresses.



MAJOR COMPONENTS
LOCATION OF NUTS AND BOLTS (TYPICAL)
LOCATION OF RIVETS (TYPICAL)

A certain method in which trusses of the bridge were assembled is historically evident. The most important clue as to how they were constructed was the particular arrangements of bolts and rivets found on connectors, (see Sheet 7 of the existing condition drawings). This system would indicate that the trusses were pre-fabricated in parts and assembled on site. By these arrangements, two major components are seen to make up one truss. As they were assembled, the components were eased onto ten-inch I-beams, with slots provided in the joints for the bottom chord of the trusses and also in the top flanges of the I-beams approximately seven inches from each end, (see detail 11/6 on Sheet 6).

Railings of the bridge transverse the whole length. They are two-inch pipes connected together by two and one quarter-inch long couplers. Lengths of the railing pieces vary from thirteen feet five inches to fifteen feet three inches. There are twelve long pieces on each side of the bridge with six on the top and six on the bottom. These railings are supported by all vertical members spaced from ten feet one inch to thirteen feet six and one half inches apart along the length of the bridge. The bottom railings are approximately one foot nine inches above the decking and the top railings are three feet one and one half inches above. A section of the railings, at the berm side of the bridge facing downstream, bends outward from the decking to a distance of about two feet.

Presently, this iron bridge is “supported” by a series of telephone poles one-foot diameter. The first pair located between the towpath and the lock; the second pair between the lock

and the iron-column network and the last pair between the iron columns and the by-pass flume. The first two pairs mentioned stand squarely on copingstones of Lock No. 68 and the last pair is standing on a makeshift base made of timber. They were installed by the property owner “to prevent the bridge from collapsing from the weight of traffic.”

IV. PROPOSED WORK PROGRAM

The repair work on the iron bridge at Lock No. 68 will be treated as a stabilization project to be done in three phases. The first phase, being the most important, will treat abutments on both sides of the bridge; the second phase will involve the work on the bridge itself, and the third will be the finishing of the area affected by the stabilization.

Phase I:

Before any work on the abutments is started, the bridge will be shored up. Then the major stones in the walls of this structure will be identified for re-alignment. All vegetation and loose materials will be removed from the walls of the abutments. Concrete sills that rest on top of walls facing the canal will be removed. Out-of-place stones will be removed, cleaned and re-laid on a fresh bed of mortar. All joints and small voids between existing stones will be filled with fresh mortar. Large voids will be filled with concrete, leaving a reveal of one and one half to two inches from the face of stonewalls. (This procedure will clearly identify missing stones from the structure.) Grout will be placed into voids behind stonewalls to create a monolithic mass and also to make the walls waterproof. This procedure will be done in three-foot increments starting at the bottom. After grouting is completed, new concrete sills will be poured onto top of walls facing the canal in two parts, the first being the base and the second being the sill. New bearing plates will be placed on top of the base to receive the beams of the bridge.

Phase II:

The bridge at Lock No. 68 will be given a "face lift". Rust will be removed and a fresh coat of paint will be applied. Loose tie-rods found underneath the decking and the bent portion of the railings will be repaired. Any rotten or missing planks of three-inch by six to eight-inch white oak will be removed and replaced with sound planks. The bridge then can be re-opened to traffic with a limited weight of three tons per axle as determined to be the safe maximum load.

Phase III:

The surrounding area after the completion of the stabilization of the abutments and the bridge will be cleaned and restored to its original condition.

Package Estimating Detail

Item	Estimated Costs	
Clear and grub, L. S.		1,500
Shoring of the bridge	3,500	
Abutment on towpath side		
- Re-alignment of stones, (removal, cleaning and resetting)	3,000	
-Filling of joints and voids	2,500	
-Grouting (60 C.Y. @ $175/C.Y.)	10,500	
Abutment on berm side		
-Re-alignment of stones, (removal, cleaning and resetting)	2,500	
-Filling of joints and voids	2,500	
-Grouting (58 C.Y. @ $175/C.Y.)	10,150	
Concrete sills for both abutments		
-Removal	1,000	
-New concrete (8 C.Y. @ $150/C.Y.)	1,200	36,850
Bridge		
-Cleaning and painting	2,500	
-Repairs to tie-rods and railings	2,500	
-New bearing plates	500	4,500
Seeding and restoration of surrounding area		500
Construction Total		$43,350

DRAWINGS

412/28005 (set of 7)
Iron Bridge at Lock #68
Milepost 164.83
C & O Canal National Historical Park
Allegany County, Md.

In order to expedite the preservation of the structure, the drawings of the existing conditions that are a part of this historic structure report have been developed. The drawings in this report were prepared by Historical Architect Thomas E. Fields, C & O Canal Restoration Team, Denver Service Center.

Note: These drawings are not included in the 2012 electronic edition.

PHOTOGRAPHS

Photographs by Thomas E. Fields

Photographs by Jet T. Lowe, April 1989
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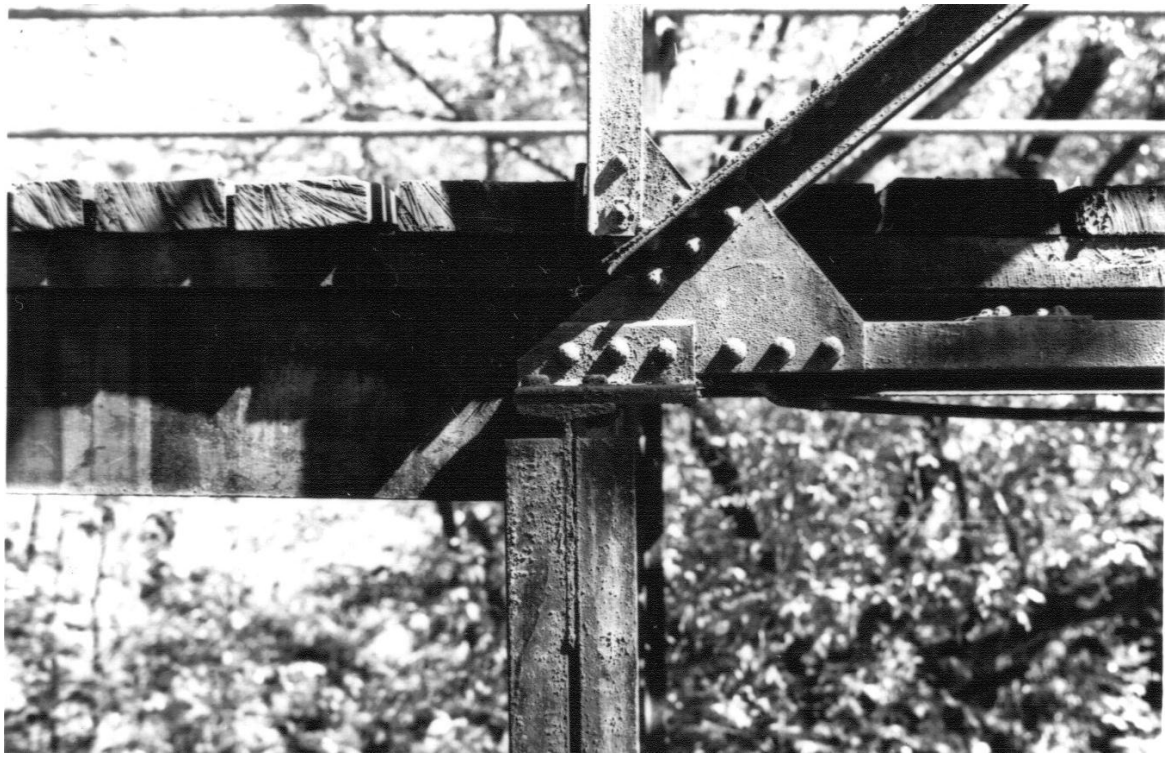
Photographs by Thomas E. Fields

1. The iron bridge over Lock No. 68.
View from outside the towpath at upriver side of abutment.

2. View of abutment from downriver side of bridge at towpath.
Note settlement and voids in stonewalls.

3. View of abutment at berm side facing downriver.
Note outlet of by-pass flume at bottom of photograph.

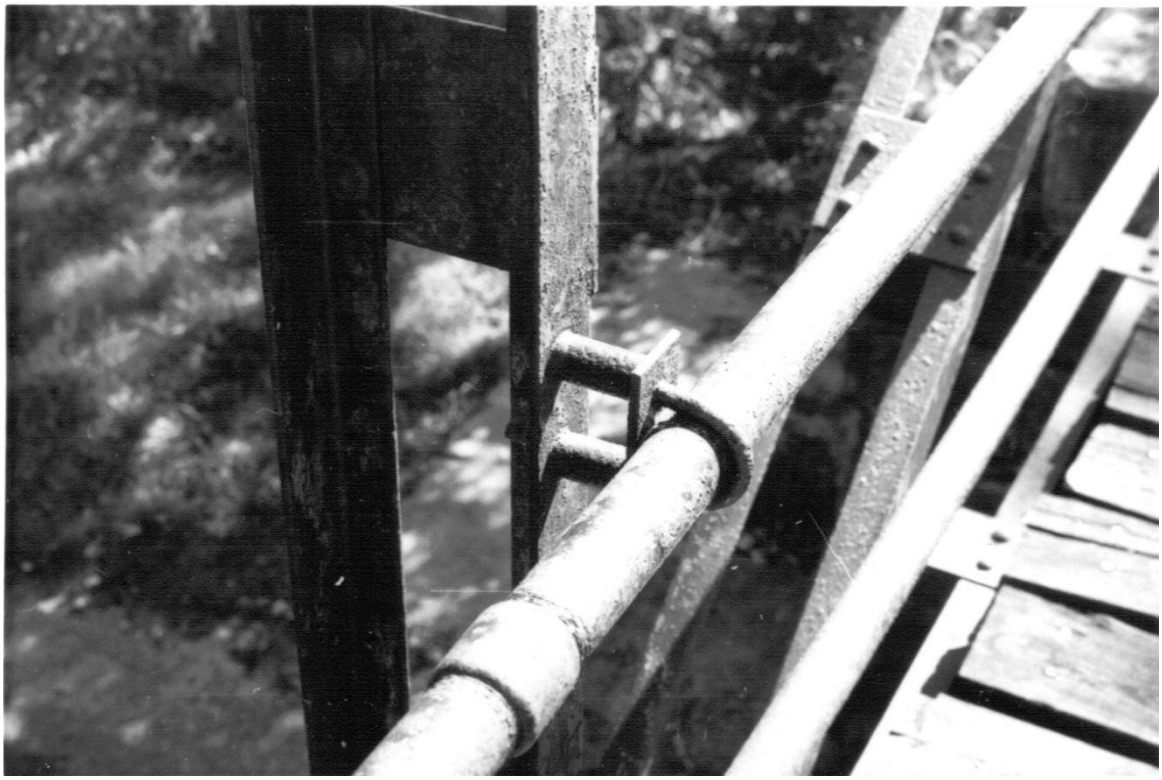
4. View of iron-column and tie-rod network between two different structural systems, the trussed span and the simple beam-and-post span.



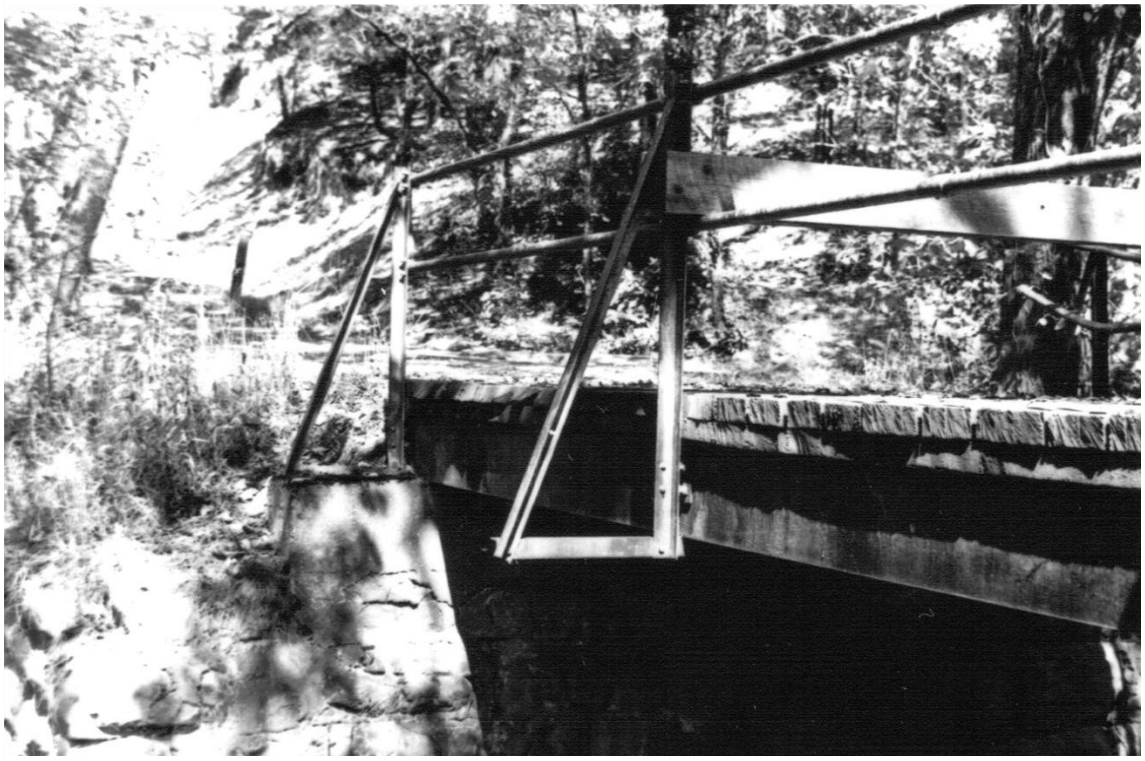
5. Connection detail showing transition between the trussed span and the simple beam-and-post span.

6. Side view of the inter-connecting members of the modified warren truss facing upriver.

7. Top view of the iron bridge showing top chords of trusses, railings and decking.



8. Detail showing how railings are fastened to vertical members of the truss.



9. View of railing support at the simple beam-and-post span.

10. View showing one of obvious rust damages on the bridge.
Note that the end of the tie-rod has been rusted through.

11. View of bent-up railing and support at the berm side of the bridge facing downriver.

Photographs by Jet T. Lowe, April 1989
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12. West Elevation.

13. Perspective view from southwest

14. Deck view, looking south.

15. Detail of southwest end post, looking up the canal.

16. Detail of eastern panel, looking southeast.